

What Is Claimed Is:

1. A smoking article comprising:
 - 5 a tobacco rod having a wrapper formed around the tobacco rod, the wrapper including a patterned deposit on at least a portion of one surface of the wrapper, wherein the patterned deposit comprises catalyst particles capable of catalyzing, oxidizing and/or reducing the conversion of a constituent gas component in the mainstream and/or sidestream smoke of the smoking article.
- 10 2. The smoking article of claim 1, wherein the constituent gas component is carbon monoxide and/or nitric oxide.
- 15 3. The smoking article of claim 1, wherein the catalyst is capable of reducing the amount of smoke constituents other than carbon monoxide and nitric oxide.
- 20 4. The smoking article of claim 1, wherein the average particle size of the catalyst is less than about 5 microns or less than about 50 nm.
- 25 5. The smoking article of claim 1, wherein the catalyst comprises at least one oxide of at least one element selected from the group consisting of B, Al, Si, Ti, Fe, Co, Ni, Cu, Zn, Ge, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Sn, Ce, Hf, Ta, W, Re, Os, Ir, Pt and Au.
- 30 6. The smoking article of claim 1, wherein the catalyst consists essentially of at least one oxide of at least one element selected from the group consisting of B, Al, Si, Ti, Fe, Co, Ni, Cu, Zn, Ge, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Sn, Ce, Hf, Ta, W, Re, Os, Ir, Pt and Au.

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7. The smoking article of claim 1, wherein the deposit is binder-free.
8. The smoking article of claim 1, wherein the catalyst comprises iron oxide.
- 5 9. The smoking article of claim 1, wherein the catalyst comprises FeOOH, Fe₃O₄, α -Fe₂O₃, γ -Fe₂O₃, FeO or mixtures thereof.
- 10 10. The smoking article of claim 1, wherein the catalyst comprises particles of a first oxide supported on particles of a second compound.
- 15 11. The smoking article of claim 10, wherein the second compound comprises calcium carbonate.
12. The smoking article of claim 1, wherein the deposit includes a pattern having a plurality of discrete features including an alphanumeric sequence, a pictogram or a geometric shape.
- 20 13. The smoking article of claim 1, wherein the pattern includes a concentration gradient of the catalyst between a first portion having a low concentration feature and a second portion having a high concentration feature.
14. The smoking article of claim 1, wherein the features of the pattern are repetitive along an axial direction of the smoking article.
- 25 15. The smoking article of claim 1, wherein the catalyst is deposited on an inner surface of the wrapper.
- 30 16. The smoking article of claim 1, wherein the catalyst is deposited on an outer surface of the wrapper.

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17. The smoking article of claim 1, wherein the wrapper is a first wrapper and the smoking article further comprises a second wrapper.

5 18. The smoking article of claim 17, wherein the second wrapper is radially outward of the first wrapper.

19. The smoking article of claim 17, wherein the total amount of catalyst on the second wrapper is zero.

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20. The smoking article of claim 17, wherein a ratio, in weight percent, of catalyst on the second wrapper to catalyst on the first wrapper is less than 0.25.

15 21. The smoking article of claim 1, wherein the wrapper has a linearly distal portion and a linearly proximal portion with respect to a first end of the smoking article, and the linearly distal portion has a first loading of the catalyst and the linearly proximal portion has a second loading of the catalyst.

22. The smoking article of claim 21, wherein the first loading of the catalyst is less than the second loading of the catalyst.

23. The smoking article of claim 1, wherein the permeability of the wrapper is no less than 15 CORESTA units.

25 24. The smoking article of claim 1, wherein the areal coverage of catalyst on the wrapper is less than about 90% or less than about 50% of the total surface area of the wrapper.

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25. The smoking article of claim 1, wherein the areal coverage of catalyst on the wrapper is greater than about 1% or greater than about 5% of the total surface area of the wrapper.

5 26. The smoking article of claim 1, wherein the features of the pattern repeat such that the largest area of uncoated wrapper does not exceed a circular area having a diameter of 1 micron or a diameter of 10 mm.

10 27. The smoking article of claim 1, wherein the total amount of the catalyst is less than about 10 mg/smoking article or less than about 100 mg/smoking article.

15 28. The smoking article of claim 1, wherein the particles are deposited in an amount effective to reduce the concentration in mainstream and/or sidestream smoke of carbon monoxide and/or nitric oxide by at least 10% or by at least 25%.

29. The smoking article of claim 1, wherein the catalyst is hydrogen bonded to the wrapper.

20 30. A smoking article comprising:
a cigarette tobacco rod having a wrapper, the wrapper including a patterned deposit on at least a portion of one surface of the wrapper,
wherein the patterned deposit comprises an iron oxide nanoparticle catalyst.

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31. A method of making a smoking article, comprising:

- (i) depositing catalyst particles on at least a portion of a surface of a wrapper to form a patterned deposit of the particles on the wrapper;
- (ii) providing a cut filler comprising tobacco to a cigarette making machine; and
- (iii) placing the wrapper including the patterned deposit around the cut filler to form a tobacco rod portion of the smoking article.

32. The method of claim 31, wherein the catalyst particles are deposited by gravure printing, rotogravure printing, photogravure printing, screen printing, flexographic printing, relief printing, intaglio printing, lithographic printing, spraying, brushing, rolling or size press techniques.

33. The method of claim 31, wherein the catalyst particles are deposited in the absence of a binder.

34. The method of claim 31, wherein dry catalyst particles are deposited on a base web of the wrapper.

35. The method of claim 31, wherein the catalyst particles are deposited by dispersing the particles in a liquid to form a mixture and depositing the mixture on the wrapper.

36. The method of claim 35, wherein the liquid comprises alcohol, water and/or other solvents and mixtures thereof.

37. The method of claim 35, further comprising drying the patterned deposit by heating the wrapper.

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38. The method of claim 31, further comprising adding a pigment to the mixture.

39. The method of claim 31, wherein the wrapper is a first wrapper and
5 the method further comprises:

(iv) placing a second wrapper around the tobacco rod portion.

40. The method of claim 39, wherein the second wrapper is radially outward from the first wrapper.

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41. The method of claim 39, wherein the total amount of catalyst particles on the second wrapper is zero.

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42. The method of claim 39, wherein a ratio, in weight percent, of catalyst particles on the second wrapper to catalyst particles on the first wrapper is less than 0.25.

43. The method of claim 31, wherein the average particle size of the catalyst particles is less than about 5 microns or less than about 50 nm.

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44. The method of claim 31, wherein the catalyst particles comprise at least one oxide of at least one element selected from the group consisting of B, Al, Si, Ti, Fe, Co, Ni, Cu, Zn, Ge, Zr, Nb, Mo, Ru, Rh, Pd, Ag, Sn, Ce, Hf, Ta, W, Re, Os, Ir, Pt and Au.

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45. The method of claim 31, wherein the catalyst particles comprise iron oxide.

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46. The method of claim 31, wherein the catalyst particles comprise FeOOH, Fe₃O₄, α -Fe₂O₃, γ -Fe₂O₃, FeO or mixtures thereof.

47. The method of claim 31, wherein the catalyst particles comprise particles of a first oxide supported on particles of a second compound.

5 48. The method of claim 47, wherein the second compound comprises calcium carbonate.

10 49. The method of claim 31, wherein the patterned deposit includes a plurality of discrete features including an alphanumeric sequence, a pictogram or a geometric shape.

50. The method of claim 31, wherein the patterned deposit includes a concentration gradient of the catalyst particles between a first portion having a low concentration feature and a second portion having a high concentration feature.

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51. The method of claim 31, wherein the catalyst particles are deposited on an inner surface of the wrapper.

20 52. The method of claim 31, wherein the catalyst particles are deposited on an outer surface of the wrapper.

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53. The method of claim 31, wherein the wrapper has a linearly distal portion and a linearly proximal portion with respect to a first end of the smoking article, and the linearly distal portion has a first loading of the catalyst particles and the linearly proximal portion has a second loading of the catalyst particles.

54. The method of claim 53, wherein the first loading of the catalyst particles is less than the second loading of the catalyst particles.

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55. The method of claim 31, wherein the permeability of the wrapper is no less than 15 CORESTA units.

56. The method of claim 31, wherein the areal coverage of catalyst on the wrapper is less than about 90% or less than about 50% of the total surface area of the wrapper.

57. The method of claim 31, wherein the areal coverage of catalyst on the wrapper is greater than about 1% or greater than about 5% of the total surface area of the wrapper.

58. The method of claim 31, wherein the features of the pattern repeat such that the largest area of uncoated wrapper does not exceed a circular area having a diameter of 1 micron or a diameter of 10 mm.

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59. The method of claim 31, wherein the total amount of the catalyst is less than about 10 mg/smoking article or less than about 100 mg/smoking article.

60. The method of claim 31, wherein the particles are deposited in an amount effective to reduce the concentration in mainstream and/or sidestream smoke of carbon monoxide and/or nitric oxide by at least 10% or by at least 25%.

61. The method of claim 31, wherein the catalyst is hydrogen bonded to the wrapper.

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62. A wrapper for a smoking article, the wrapper comprising:
a web; and
a patterned deposit on at least a portion of one surface of the wrapper, wherein the patterned deposit comprises catalyst particles.

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63. A sheet of cigarette wrapping paper comprising a plurality of the wrappers of claim 62.

64. The wrapper of claim 62, wherein the average particle size of the catalyst is less than about 5 microns or less than about 50 nm.

65. The wrapper of claim 62, wherein the catalyst comprises iron oxide.

66. The wrapper of claim 62, wherein the catalyst comprises particles of a first oxide supported on particles of a second compound.

67. The wrapper of claim 62, wherein the deposit includes a pattern having a plurality of discrete features including an alphanumeric sequence, a pictogram or a geometric shape.

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68. The wrapper of claim 62, wherein the pattern includes a concentration gradient of the catalyst between a first portion having a low concentration feature and a second portion having a high concentration feature.

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69. The wrapper of claim 62, wherein the permeability of the wrapper is no less than 15 CORESTA units.

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70. The wrapper of claim 62, wherein the areal coverage of catalyst on the wrapper is less than about 90% or less than about 50% of the total surface area of the wrapper.

71. The wrapper of claim 62, wherein the areal coverage of catalyst on the wrapper is greater than about 1% or greater than about 5% of the total surface area of the wrapper.

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72. The wrapper of claim 62, wherein the features of the pattern repeat such that the largest area of uncoated wrapper does not exceed a circular area having a diameter of 1 micron or a diameter of 10 mm.

5 73. A method of manufacturing cigarette paper with a patterned deposit of catalyst particles, the method comprising:

- (i) forming a sheet of cigarette paper in a papermaking machine; and
- (ii) depositing catalyst particles on at least a portion of a surface of the paper to form a patterned deposit of the particles on the paper.

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74. The method of claim 73, wherein the catalyst particles are deposited by gravure printing, rotogravure printing, photogravure printing, screen printing, flexographic printing, relief printing, intaglio printing, lithographic printing, spraying, brushing, rolling or size press techniques.

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75. The method of claim 73, wherein the catalyst particles are deposited in the absence of a binder.

20 76. The method of claim 73, wherein the average particle size of the catalyst particles is less than about 5 microns or less than about 50 nm.

77. The method of claim 73, wherein the catalyst particles comprise iron oxide.

25 78. The method of claim 73, wherein the patterned deposit includes a plurality of discrete features including an alphanumeric sequence, a pictogram or a geometric shape.

30 79. A catalytic ink utilized in production of a wrapper for a smoking article, the catalytic ink comprising:

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a liquid; and
a nanoparticle catalyst suspended in the liquid.

80. A catalytic ink utilized in production of a wrapper for a smoking
5 article, the catalytic ink consisting essentially of:
a liquid; and
a nanoparticle catalyst suspended in the liquid.

81. The catalytic ink of Claim 80, wherein the ink is binder-free.